

FORM PTO-1449
(Modified)

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U.S. Department of Commerce
Patent and Trademark Office

Attorney Docket No.: COOL-01500

Serial No.: 10/643,638

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

Applicants: Peng Zhou et al

(37 CFR § 1.98(b))

Filing Date: August 18, 2003

Group Art Unit: 3753

U.S. PATENT DOCUMENTS

Examiner Initials		Serial / Patent Number	Issue Date	Applicant / Patentee	Class	Subclass	Filing Date
FZ	AA	5,179,500	01/12/93	Koubek et al.	361	385	04/02/91
	AB						
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Examiner:

Philip Rec

Date Considered:

1/26/2005

EXAMINER:

Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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F2	AA	6,632,719 B1	10/14/03	DeBoer et al.	438	381	08/31/00
	AB						
	AC						
	AD						
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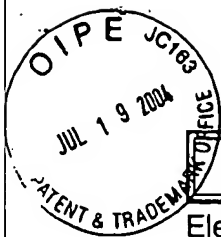
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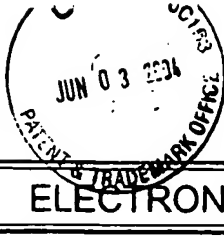
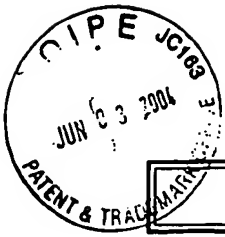


ELECTRONIC INFORMATION DISCLOSURE STATEMENT

Electronic Version v18

Stylesheet Version v18.0


Title of Invention	BOILING TEMPERATURE DESIGN IN PUMPED MICROCHANNEL COOLING LOOPS						
Application Number: 10/643638							
Confirmation Number: 4432							
First Named Applicant: Peng Zhou							
Attorney Docket Number:							
Search string: (3948316 or 5161089 or 5228502 or 5239443 or 5265670 or 5978220 or 5993750 or 6729383).pn.							
US Patent Documents							
Note: Applicant is not required to submit a paper copy of cited US Patent Documents							
init	Cite.No.	Patent No.	Date	Patentee	Kind	Class	Subclass
PZ	1	3948316	1976-04-06	Souriau			
	2	5161089	1992-11-03	Chu et al.			
	3	5228502	1993-07-20	Chu et al.			
	4	5239443	1993-08-24	Fahey et al.			
	5	5265670	1993-11-30	Zingher			
	6	5978220	1999-11-02	Frey et al.			
	7	5993750	1999-11-30	Ghosh et al.			
FZ	8	6729383	2004-05-04	Cannell et al.	B1		
Signature							
Examiner Name				Date			
Philip Zec				1/26/2005			



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PZ	16	6336497	2002-01-08	Lin	B1
	17	6366462	2002-04-02	Chu et al.	B1
	18	6367544 ^{PE}	2002-04-09	Calaman	B1
	19	6431260	2002-08-13	Agonafer et al.	B1
	20	6466442	2002-10-15	Lin	B2
	21	6519151	2003-02-11	Chu et al.	B2
	22	6533029	2003-03-18	Phillips	B1
	23	6536516	2003-03-25	Davies et al.	B2
	24	6601643	2003-08-05	Cho et al.	B2
✓	25	6609560	2003-08-26	Cho et al.	B2
PZ	26	6651735	2003-11-25	Cho et al.	B2

US Published Applications

Note: Applicant is not required to submit a paper copy of cited US Published Applications

init	Cite.No.	Pub. No.	Date	Applicant	Kind	Class	Subclass
PZ	1	20030213580	2003-11-20	Philpott et al.	A1		

Signature

Examiner Name	Date
<i>Philip Zec</i>	<i>1/26/2005</i>

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FOREIGN PATENTS OR PUBLISHED FOREIGN PATENT APPLICATIONS

		Document Number	Publication Date	Country / Patent Office	Class	Subclass	Translation	
							Yes	No
FZ	AA	97212126.9	03/04/97	CN	BO1D	61/42		X
FZ	AB	2000-277540	10/06/00	JP	H01L	21/50		X

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	AD	Kendra V. Sharp et al., "Liquid Flows in Microchannels", 2002, Vol. 6, pages 6-1 to 6-38.						
	AE	Shuchi Shoji et al., "Microflow devices and systems", J. Microtech. Microeng. 4 (1994), pages 157-171, printed in the U.K.						
	AF	Angela Rasmussen et al., "Fabrication Techniques to Realize CMOS-Compatible Microfluidic Microchannels", Journal of Microelectromechanical, Vol. 10, No. 2, June 2001, pages 286-297.						
	AG	J. H. Wang et al., "Thermal-Hydraulic Characteristic of Micro Heat Exchangers", 1991, DSC-Vol. 32, Micromechanical Sensors, Actuators, and Systems, pages 331-339.						
	AH	Gad Hetroni et al., "Nonuniform Temperature Distribution in Electronic Devices Cooled by Flow in Parallel Microchannels", IEEE Transactions on Components and Packaging Technologies, March 2001, Vol. 24, No. 1, pages 16-23.						
	AI	X. F. Peng et al., "Heat Transfer Characteristics of Water Flowing through Microchannels", Experimental Heat Transfer An International Journal, Vol. 7, No. 4, October-December 1994, pages 265-283.						
	AJ	Linan Jiang et al., "Forced Convection Boiling in a Microchannel Heat Sink", Journal of Microelectromechanical Systems, Vol. 10, No. 1, March 2001, pages 80-87.						
	AK	Muhammad M. Rahman et al., "Experimental Measurements of Fluid Flow and Heat Transfer in Microchannel Cooling Passages in a Chip Substrate", 1993, EEP-Vol. 4-2, Advances in Electronic Packages, pages 685-692.						
	AL	X. F. Peng et al., "Forced convection and flow boiling heat transfer for liquid flowing through Microchannels", 1993, Int. J. Heat Mass Transfer, Vol. 36, NO. 14, pages 3421-3427.						
	AM	Lung-Jieh Yang et al., "A Micro Fluidic System of Micro Channels with On-Site Sensors by Silicon Bulk Micromaching", September 1999, Microfluidic Devices and Systems II, Vol. 3877, pages 267-272.						
	AN	G. Mohiuddin Mala et al., "Heat transfer and fluid flow in microchannels", 1997, Int. J. Mass transfer, Vol. 40, No. 13, pages 3079-3088, printed in Great Britain.						
	AO	J. M. Cuta et al., "Fabrication and Testing of Micro-Channel Heat Exchangers", SPIE Microlithography and Metrology in Micromaching, Vol. 2640, 1995, pages 152-160.						
	AP	Linan Jiang et al., "A Micro-Channel Heat Sink with Integrated Temperature Sensors for Phase Transition Study", 1999, 12 th IEEE International Conference on Micro Electro Mechanical Systems, pages 159-164.						
	AQ	Linan Jiang et al., "Fabrication and characterization of a microsystem for a micro-scale heat transfer study", J. Micromech. Microeng. 9 (1999) pages 422-428, printed in the U.K.						
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	AS	Yongendra Joshi, "Heat out of small packages", December 2001, Mechanical Engineer, pages 56-58.						
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	AU	Lian Zhang et al., "Measurements and Modeling of Two-Phase Flow in Microchannels with Nearly Constant Heat Flux Boundary Conditions", Journal of Microelectromechanical Systems, Vol. 11, No. 1, February 2002, pages 12-19.						
	AV	Muhammad Mustafizur Rahman, "Measurements of Heat Transfer in Microchannel Heat Sinks", Int. Comm. Heat Mass Transfer, Vol. 27, No. 4, May 2000, pages 495-506.						
	AW	Issam Mudawar et al., "Enhancement of Critical Heat Flux from High Power Microelectronic Heat Sources in a Flow Channel", Journal of Electronic Packaging, September 1990, Vol. 112, pages 241-248.						
	AX	Nelson Kuan, "Experimental Evaluation of Micro Heat Exchangers Fabricated in Silicon", 1996, HTD-Vol. 331, National Heat Transfer Conference, Vol. 9, pages 131-136.						
	AY	E. W. Kreutz et al., "Simulation of micro-channel heat sinks for optoelectronic microsystems", Microelectronics Journal 31(2000) pages 787-790.						
	AZ	J. C. Y. Koh et al., "Heat Transfer of Microstructure for Integrated Circuits", 1986, Int. Comm. Heat Mass Transfer, Vol. 13, pages 89-98.						
FZ	BA	Snezana Konecni et al., "Convection Cooling of Microelectronic Chips", 1992, InterSociety Conference on Thermal Phenomena, pages 138-144.						

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OTHER DOCUMENTS (Including Author, Title, Date, Relevant Pages, Place of Publication)					
F2	BB	Michael B. Kleiner et al., "High Performance Forced Air Cooling Scheme Employing Microchannel Heat Exchangers", 1995, IEEE Transactions on Components, Packaging, and Manufacturing Technology-Part A, Vol. 18, No. 4, pages 795-804.			
	BC	Jerry K. Keska Ph. D. et al., "An Experimental Study on an Enhanced Microchannel Heat Sink for Microelectronics Applications", EEP-Vol. 26-2, Advances in Electronic Packaging, 1999, Vol. 2, pages 1235-1259.			
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	BE	Joseph C. Tramontana, "Semiconductor Laser Body Heat Sink", Xerox Disclosure Journal, Vol. 10, No. 6, November/December 1985, pages 379-381.			
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	BI	John M. Waldvogel, "Aluminum Silicon Carbide Phase Change Heat Spreader", Motorola, June 1999, Technical Developments, pages 226-230.			
	BJ	James P. Slupe et al., "An idea for maintaining a stable thermal environment for electronic devices", Research Disclosure, August 2001, page 1312.			
	BK	John M. Waldvogel, "A Heat Transfer Enhancement Method for Forced Convection Bonded-Fin Heatsinks", Motorola, December 1997, Technical Developments, pages 158-159.			
	BL	"Thin Heat Pipe for Cooling Components on Printed Circuit Boards", IBM Technical Disclosure Bulletin, Vol. 34, No. 7B, December 1991, pages 321-322.			
	BM	R. C. Chu et al., "Process for Nucleate Boiling Enhancement", IBM Technical Disclosure Bulletin, Vol. 18, No. 7, December 1975, page 2227.			
	BN	J. Riseman, "Structure for Cooling by Nucleate Boiling", IBM Technical Disclosure Bulletin, Vol. 18, No. 11, April 1976, page 3700.			
	BO	"Integrally Grooved Semiconductor Chip and Heat Sink", October 1971, IBM Technical Disclosure Bulletin, Vol. 14, No. 5, page 1425.			
	BP	"Enhanced Cooling of Thermal Conduction Module", IBM Technical Disclosure Bulletin, Vol. 30, No. 5, October 1987, page 426.			
	BQ	"Heat Exchanger Modules for Data Process with Valves Operated by Pressure form Cooling Water Pump", IBM Technical Disclosure Bulletin, Vol. 30, No. 5, October 1987, page 419.			
	BR	"Cold Plate for Thermal Conduction Module with Inlet for Cooling Water Near Highest Power Chips", IBM Technical Disclosure Bulletin, Vol. 30, No. 5, October 1987, page 413.			
	BS	"Circuit Module Cooling with Coaxial Bellow Providing Inlet, Outlet and Redundant Connections to Water-Cooled Element", IBM Technical Bulletin, Vol. 30, No. 5, October 1987, pages 345-347.			
	BT	"Piping System with Valves Controlled by Processor for Heating Circuit Modules in a Selected Temperature Profile for Sealing Integrity Test Under Temperature Stress", IBM Technical Disclosure Bulletin, Vol. 30, No. 5, October 1987, page 336.			
	BU	"Cooling System for Chip Carrier on Card", IBM Technical Disclosure Bulletin, Vol. 31, No. 4, September 1988, pages 39-40.			
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	BX	N. P. Bailey et al., "Cooling Device for Controlled Rectifier", IBM Technical Disclosure Bulletin, Vol. 21, No. 11, April 1979, pages 4609-4610.			
	BY	W. J. Kleinfelder et al., "Liquid-Filled Bellows Heat Sink", IBM Technical Disclosure Bulletin, Vol. 21, No. 10, March 1979, pages 4125-4126.			
	BZ	R. P. Chrisfield et al., "Distributed Power/Thermal Control", IBM Technical Disclosure Bulletin, Vol. 22, No. 3, August 1979, pages 1131-1132.			
	CA	A. J. Arnold et al., "Heat Sink Design for Cooling Modules in a Forced Air Environment", IBM Technical Disclosure Bulletin, Vol. 22, No. 6, November 1979, pages 2297-2298.			
	CB	A. J. Arnold, "Structure for the Removal of Heat from an Integrated Circuit Module", IBM Technical Disclosure Bulletin, Vol. 22, No. 6, November 1979, pages 2294-2296.			
	CC	U. P. Hwang et al., "Cold Plate for Thermal Conduction Module with Improved Flow Pattern and Flexible Base", IBM Technical Disclosure Bulletin, Vol. 25, No. 9, February 1983, page 4517.			
F2	CD	K. C. Gallagher et al., "Cooling System for Data Processor with Flow Restrictor in Secondary Loop to Limit Bypass-Cooling Water Flow", IBM Technical Disclosure Bulletin, Vol. 26, No. 5, October 1983, page 2658.			
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F2	CE	R. C. Chu et al., "Silicon Heat Sink for Semiconductor Chip", IBM Technical Disclosure Bulletin, Vol. 24, No. 11A, April 1982, page 5743.			
	CF	J. M. Eldridge et al., "Heat-Pipe Vapor Cooling Etched Silicon Structure", IBM Technical Disclosure Bulletin, Vol. 25, No. 8, January 1983, pages 4118-4119.			
	CG	J. R. Skobern, "Thermoelectrically Cooled Module", IBM Technical Disclosure Bulletin, Vol. 27, No. 1A, June 1984, page 30.			
	CH	M. J. Brady et al., "Etched Silicon Integrated Circuit Heat Sink", IBM Technical Disclosure Bulletin, Vol. 27, No. 1B, June 1984, page 627.			
	CI	H. D. Edmonds et al., "Heat Exchange Element for Semiconductor Device Cooling", IBM Technical Disclosure Bulletin, Vol. 23, No. 3, August 1980, page 1057.			
	CJ	R. W. Noth, "Heat Transfer from Silicon Chips and Wafers", IBM Technical Disclosure Bulletin, Vol. 17, No. 12, May 1975, page 3544.			
	CK	"Forced Boiling Cooling System with Jet Enhancement for Critical Heat Flux Extension", IBM Technical Disclosure Bulletin, Vol. 39, No. 10, October 1996, page 143.			
	CL	"Miniature Heat Exchanger for Corrosive Media", IBM Technical Disclosure Bulletin, Vol. 38, No. 01, January 1995, pages 55-56.			
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